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In re application of : Gennadi FINKELSHTAIN et al.

Serial No. : 10/757,849

Filed : January 16, 2004

For : STORAGE-STABLE FUEL CONCENTRATE

Attorney Docket No. P24712

Mail Stop Amendment

Confirmation No. 5103

Group Art Unit : 1714

Examiner : Thexton, Mathew

Mail Stop Amendment

Commissioner for Patents

U.S. Patent and Trademark Office

Customer Service Window, Mail Stop Appeal Brief-Patents

Randolph Building

401 Dulany Street

Alexandria, VA 22314

Sir:

Transmitted herewith is an **Appeal Brief under C.F.R. § 41.37** in the above-captioned application.

☐ Small Entity Status of this application under 37 C.F.R. 1.9 and 1.27 has been established by a previously filed statement.

☐ A verified statement to establish small entity status under 37 C.F.R. 1.9 and 1.27 is enclosed.

☐ A Request for Extension of Time.

☐ No additional fee is required.

The fee has been calculated as shown below:

Claims After Amendment	No. Claims Previously Paid For	Present Extra	Small Entity		Other Than A Small Entity	
			Rate	Fee	Rate	Fee
Total Claims: 68	*69	0	X25=	\$	x 50=	\$ 0.00
Indep. Claims: 6	**6	0	X100=	\$	X200=	\$ 0.00
Multiple Dependent Claims Presented			+180=	\$	+360=	\$ 0.00
Appeal Brief				\$		\$ 500.00
			Total:	\$	Total:	\$ 500.00

* If less than 20, write 20

** If less than 3, write 3

☐ Please charge my Deposit Account No. 19-0089 in the amount of \$_____.

☒ A Check in the amount of **\$500.00** to cover the filing fee(s) is included.

☒ The U.S. Patent and Trademark Office is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 19-0089.

☒ Any additional filing fees required under 37 C.F.R. 1.16.

☒ Any patent application processing fees under 37 C.F.R. 1.17, including any required extension of time fees in any concurrent or future reply requiring a petition for extension of time for its timely submission (37 CFR 1.136)(a)(3).

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Gennadi FINKELSHTAIN et al. **Confirmation No.: 5103**
Serial No. : 10/757,849 **Group Art Unit: 1714**
Filed : January 16, 2004 **Examiner: Toomer, Cephia D**
For : STORAGE-STABLE FUEL CONCENTRATE

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Commissioner for Patents
U.S. Patent and Trademark Office
Customer Service Window, Mail Stop Appeal Brief - Patents
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

This Appeal is from the Examiner's Final Rejection of claims 70-97, 99, 101-116, 119-130 and 132-139 set forth in the Advisory Action mailed from the U.S. Patent and Trademark Office on December 19, 2006.

A Notice of Appeal in response to the October 24, 2006 Final Office Action and the Advisory Action mailed December 19, 2006 was filed on March 23, 2007.

The requisite fee under 37 C.F.R. § 41.20(b)(2) for filing this Appeal Brief (\$500.00) is being paid by the enclosed check.

Inasmuch as this Appeal Brief is being filed within the initial two-month period prescribed by 37 C.F.R. § 41.37(a)(1), set to expire May 23, 2007, it is believed that no extension of time is required. However, the Patent and Trademark Office is authorized to charge any fee

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necessary for maintaining the pendency of this application, including any appeal or extension of time fees that may be necessary, to Deposit Account No. 19-0089.

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I. REAL PARTY IN INTEREST

The real party in interest in this appeal is the More Energy Ltd., Israel. The corresponding assignments were recorded in the U.S. Patent and Trademark Office on October 25, 2005 at REEL 017139, FRAME 0039 and on April 23, 2007 at REEL 019192, FRAME 0210.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' representative or the Assignee are not aware of any other prior and pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

The status of the claims is as follows:

Claims 70-99, 101-117 and 119-139 are pending in this application.

Each of claims 70-97, 99, 101-116, 119-130 and 132-139 is indicated as rejected in the Advisory Action mailed December 19, 2006. Claims 98, 117 and 131 are allowed. Claims 1-69, 100 and 118 are cancelled.

The rejection of each of claims 70-97, 99, 101-116, 119-130 and 132-139 is under appeal. Claims 70-97, 99, 101-116, 119-130 and 132-139 involved in the appeal are reproduced in the Claims Appendix attached hereto.

IV. STATUS OF AMENDMENTS

An Amendment under 37 C.F.R. § 1.116 was filed on November 30, 2006 in response to the Final Office Action mailed October 24, 2006. According to the Advisory Action mailed December 19, 2006, the Amendment will be entered for purposes of the appeal.

V. SUMMARY OF CLAIMED SUBJECT MATTER

A. Claim 70

Independent claim 70 is drawn to a process for preparing a metal hydride containing liquid for use as a fuel in a direct liquid fuel cell from a storage-stable concentrate. The process comprises combining (a) a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration of at least about 7 moles per liter, and not more than about 2 % of the at least one metal hydride compound decomposes when the concentrate is stored for 4 weeks at about 25°C, and (b) a solvent in an amount of at least about 15 % by volume of the concentrate. See, e.g., page 4, lines 17-23 of the present specification.

B. Claim 84

Independent claim 84 is drawn to a process for producing a packaged combination for making a fuel for use with a direct liquid fuel cell, which fuel comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration of not higher than about 7 moles per liter. The process comprises providing a container having a first compartment and at least one second compartment, partially or completely filling the first compartment with a concentrate which differs from the fuel at least by comprising only a part of the polar solvent and

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by having a hydroxide ion concentration which is higher than the hydroxide ion concentration of the fuel, and partially or completely filling the at least one second compartment with an amount of polar solvent which in combination with the concentrate will afford the fuel. See, e.g., specification at page 5, lines 18-27 and the passage from page 10, line 4 from the bottom to page 11, line 7.

C. Claim 101

Independent claim 101 is drawn to a container for providing a fuel for use with a direct liquid fuel cell, which fuel comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration of not higher than about 7 moles per liter. The container comprises a first compartment and at least one second compartment. The first compartment contains a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration which is higher than the hydroxide ion concentration of the fuel. The at least one second compartment contains a solvent. Combining the solvent in the at least one second compartment and the concentrate in the first compartment affords the fuel. See, e.g., specification at page 6, lines 1-8 from the bottom and the passage from page 10, line 4 from the bottom to page 11, line 7.

D. Claim 119

Independent claim 119 is drawn to a packaged combination for providing a fuel for use with a direct liquid fuel cell. The combination comprises a first container and at least one second container. The first container contains a concentrate which comprises at least one metal hydride

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compound and a polar solvent and has a hydroxide ion concentration which is higher than the hydroxide ion concentration of the fuel. The at least one second container contains a solvent in an amount which is sufficient to result in the fuel if the solvent in the at least one second container and the concentrate in the first container are combined. See, e.g., specification at page 8, lines 1-9 and the passage from page 10, line 4 from the bottom to page 11, line 7.

E. Claim 132

Independent claim 132 is drawn to a method of reducing the decomposition of a fuel for a direct liquid fuel cell during storage of the fuel. The method comprises storing the fuel as a concentrate and diluting the concentrate to prepare the fuel only before using the fuel in the fuel cell. The concentrate comprises at least one metal hydride compound, a polar solvent, and at least one hydroxide ion providing compound. After storing the concentrate for 4 weeks at about 25°C not more than about 2 % of the at least one metal hydride compound has decomposed. See, e.g., page 8, lines 18-22 in combination with, e.g., page, lines 4-8 from the bottom of the present specification.

F. Claim 135

Independent claim 135 is drawn to a container for making a fuel for use with a direct liquid fuel cell. The container comprises a first compartment and at least one second compartment. The first compartment contains a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration which is higher than the hydroxide ion concentration of the fuel. The at least one second compartment contains a

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solvent in an amount which is sufficient to afford the fuel if the solvent in the at least one second compartment and the concentrate in the first compartment are combined. Further, after storing the concentrate for 4 weeks at about 25°C not more than about 2 % of the at least one metal hydride compound has decomposed. See, e.g., page 6, lines 1-8 from the bottom of the present specification in combination with, e.g., page, lines 4-8 from the bottom of the present specification.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The broad issues under consideration are:

1. Whether claims 70-83 and 132-134 are properly rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over Finkelshtain et al., US 2002/0083640 A1 (hereafter “FINKELSHTAIN”) alone or in view of Amendola et al., US 2002/0083643 A1 (hereafter “AMENDOLA”) and further in view of the evidentiary document Pecsok, R.L., “Polarographic Studies on the Oxidation and Hydrolysis of Sodium Borohydride,” J. Am. Chem. Soc., (75), 1953, pp. 2862-4 (hereafter “PECSOK”) and in particular, whether the disclosures of FINKELSHTAIN and AMENDOLA (in view of PECSOK) are sufficient to anticipate the subject matter of claims 70-83 and 132-134 or are sufficient to establish a *prima facie* case of obviousness of the subject matter of these claims, respectively.

2. Whether claims 84-97, 99, 101-116, 119-130 and 135-139 are properly rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over FINKELSHTAIN alone or in view of AMENDOLA and further in view of PECSOK and in particular, whether the disclosures

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of FINKELSHTAIN and AMENDOLA (and PECSOK) are sufficient to establish a *prima facie* case of obviousness of the subject matter of claims 84-97, 99, 101-116, 119-130 and 135-139.

3. Whether claims 70-83 and 132-134 are properly rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Suda, US 2002/0015869 A1 (hereafter “SUDA”) alone or in view of AMENDOLA and in particular, whether the disclosures of SUDA and AMEDOLA are sufficient to establish a *prima facie* case of obviousness of the subject matter of claims 70-83 and 132-134.

4. Whether claims 70-83 and 132-134 are properly rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over Tsang, U.S. Patent No. 6,818,334 B2 (hereafter “TSANG I”) alone or in view of AMENDOLA and in particular, whether the disclosures of TSANG I and AMENDOLA are sufficient to anticipate the subject matter of claims 70-83 and 132-134 or are sufficient to establish a *prima facie* case of obviousness of the subject matter of these claims, respectively.

5. Whether claims 84-97, 99, 101-116, 119-130 and 135-139 are properly rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over TSANG I or Tsang, EP 1369947 A2 (hereafter “TSANG II”), each alone or in view of AMENDOLA and in particular, whether the disclosures of TSANG I or TSANG II and AMENDOLA are sufficient to establish a *prima facie* case of obviousness of the subject matter of claims 84-97, 99, 101-116, 119-130 and 135-139.

6. Whether claims 70-83 and 132-134 are properly rejected under 35 U.S.C. § 102(a) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as

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allegedly being obvious over TSANG II alone or in view of AMENDOLA and in particular, whether the disclosures of TSANG II and AMENDOLA are sufficient to anticipate the subject matter of claims 70-83 and 132-134 or are sufficient to establish a *prima facie* case of obviousness of the subject matter of these claims, respectively.

Appellants note that according to the Final Office Action mailed October 24, 2006, claims 75, 88-90, 108, 109 and 123 are rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. In the Amendment filed November 30, 2006 in response to the Final Office Action (entered by the Examiner) Applicants amended claims 75, 88, 108 and 123 by deleting the allegedly not originally disclosed compound $(\text{CH}_3)_3\text{NBH}_3$ from these claims to render this rejection moot. Further, the Advisory Action mailed December 19, 2006 only states that Applicants allegedly have not amended the claims to overcome the prior art of record but does not address the written description requirement. Accordingly, Appellants assume that the Examiner has withdrawn the rejection of claims 75, 88-90, 108, 109 and 123 under 35 U.S.C. § 112, first paragraph.

VII. ARGUMENTS

A. Citation of Authority

Anticipation under 35 U.S.C. § 102 requires the disclosure in a single piece of prior art to show each and every limitation of a claimed invention. *Celeritas Technologies, Ltd. v. Rockwell International Corporation*, 150 F.3d 1354, 1360, 47 USPQ 2d 1516, 1522 (Fed. Cir. 1998); *Oakley, Inc. v. Sunglass Hut International*, 65 USPQ2d 1321, 1325 (Fed. Cir. 2003); *Applied*

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Medical Resources Corporation v. United States Surgical Corporation, 147 F.3d 1374, 1377, 47 USPQ2d 1289, 1291 (Fed. Cir. 1998); *Rockwell International Corporation v. The United States, et al.*, 147 F.3d 1358, 47 USPQ2d 1027, 1029 (Fed. Cir. 1998).

An "anticipating" reference must describe all of the elements and limitations of the claim in a single reference, and enable one of skill in the field of the invention to make and use the claimed invention. *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1378-79 (Fed. Cir. 2001); *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226 (Fed. Cir. 1989). *Merck & Co., Inc., v. Teva Pharmaceuticals USA, Inc.* 347 F.3d 1367 (Fed. Cir. 2003).

A prior art reference anticipates a patent claim if the reference discloses, either expressly or inherently, all of the limitations of the claim. *EMI Group N. Am., Inc., v. Cypress Semiconductor Corp.*, 268 F.3d 1342, 1350 (Fed. Cir. 2001); *Schering Corp. v. Geneva Pharm.*, 339 F.3d 1373, 1379 (Fed. Cir. 2003).

In order to be anticipating, a prior art reference must be enabling so that the claimed subject matter may be made or used by one skilled in the art. *Amgen Inc. v. Hoechst Marion Roussel, Inc.* 314 F.3d 1313, 1354 (Fed. Cir. 2003).

If a reference does not expressly set forth a particular element of a claim, that reference may still anticipate the claim if the element is "inherent" from the reference. Matter is "inherent" if the extrinsic evidence makes it clear that the matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. *Titanium Metals Corp. v. Banner*, 778 F.2d 775 (Fed. Cir. 1985); *In re Cruciferous Sprout Litig.*, 301 F.3d 1343, 1349-50 (Fed. Cir. 2002); *In re Crish*, 393 F.3d 1253, 1258-59 (Fed. Cir. 2004).

Inherency, however, cannot arise from probabilities or possibilities. The mere fact that a certain

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thing may result from a given set of circumstances is not sufficient. To the contrary, a certain thing must result from a given set of circumstances to be inherent. *In re Robertson*, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991) and MPEP 2142. "If the Examiner fails to establish a *prima facie* case, the rejection is improper and will be overturned." *In re Rijckaert*, 9 F.3d, 1532, 28 U.S.P.Q.2d, 1956 (Fed. Cir. 1993), citing *In re Fine*, 837 F.2d 1071, 1074, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988).

The appropriate starting point for a determination of obviousness is stated in Graham v. John Deere Co., 383 U.S. 1, 17, 148 U.S.P.Q. 459, 466 (1966):

Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined.

The test of obviousness *vel non* is statutory and requires a comparison of the claimed subject matter as a whole with the prior art to which the subject matter pertains. *In re Brouwer*, 77 F.3d, 422, 37 U.S.P.Q. 2d 1663 (Fed. Cir. 1996); *In re Ochiai*, 71 F.3d 1565, 37 U.S.P.Q. 2d {P24712 00179184.DOC}

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1127 (Fed. Cir. 1995). Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. MPEP 2143.01.

B. Claims 70-83 and 132-134 Are Not Properly Rejected under 35 U.S.C. § 102 (b) or 103(a) As Being Anticipated by or Obvious Over FINKELSHTAIN or Being Obvious Over FINKELSHTAIN/AMENDOLA/PECSOK

1. Summary of Rejection

The rejection essentially asserts that FINKELSHTAIN discloses fuel mixtures for fuel cells comprising a hydride such as NaBH_4 and an electrolyte such as KOH and that this document states in paragraphs [0017] to [0020] thereof that the hydride solutions are unstable in acid or neutral conditions but stable in basic media, wherefore one of ordinary skill in the art allegedly would have immediately envisaged to create a basic solution to obtain the stability noted. The rejection also points to paragraph [0040] of FINKELSHTAIN where it is stated that 6 M KOH has been shown to be ideal for fuel cell operation at ambient temperatures and that when considering the exact composition of the fuel composition factors such as stability and solubility are taken into account. In view of these statements, the Examiner takes the position that “it would be immediately envisaged that the disclosed stability objective is a function of basicity and mere dilution to 6M would obtain the noted preference, as required by claims 70-83 and

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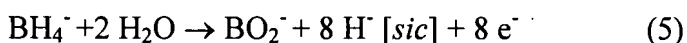
132-134” and that FINKELSHTAIN “suggests employing basic solutions for stability, and suggests employing 6M hydroxide ions for optimal electrical output; one of ordinary skill in the art would realize that dilution of a storage stable solution of pH>7 is the way to accomplish both goals.”

The rejection also states that “in the event the reference [FINKELSHTAIN] is deemed to be of not sufficient specificity to sustain a conclusion of anticipation, such as the hydroxide concentration of claims 70-83, then it is concluded that it would have been obvious to one of ordinary skill in the art ... to have varied the degree of basicity as suggested (“pH above 7” [0023]) to obtain the desired level of stability, knowing that stability is a function of basicity (Pecsok (1953)), whether storing it in the laboratory or in commerce, it would be apparent that longer storage is desirable and obtainable by the expedient suggested. Accordingly, having obtained the obvious concentrate for storage property, it would have been obvious to one of ordinary skill in the art ... to dilute for use, as it is suggested to employ 6M concentration ([0040]), as required by claim 70-83 and 132-134. To the extent that the claims require a pH not suggested by the reference, ‘643 [AMENDOLA] suggests that higher pH is more effective ([0033]), as well as suggests starting with a concentrated solution and adding water during use ([0032] at the last two 2-4 lines of page 2)...“.

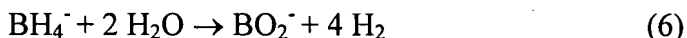
2. FINKELSHTAIN Neither Anticipates Nor Renders Obvious Claims 70-83 and 132-134

The passages of FINKELSHTAIN relied on by the Examiner in the rejection of claims 70-83 and 132-134 over this document are paragraphs [0017] to [0020] and [0040] thereof. These paragraphs are reproduced below (emphases added):

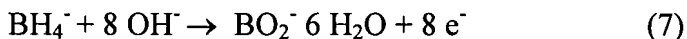
[0017] One such compound is NaBH_4 . In water, [sic] NaBH_4 dissociates to give BH_4^- . In a neutral solution BH_4^- is oxidized at the anode according to equation 5:



[0018] The greatest drawbacks of hydrogen-containing inorganic compounds as fuel is the spontaneous decomposition of these compounds in acidic and neutral solutions, equation 6:



[0019] In a basic solution BH_4^- is oxidized at the anode according to equation 7:



[0020] Although stable in basic solutions, BH_4^- decomposes on contact with a catalyst, such as found on the anode of a fuel cell, even when the circuit is broken.

[0040] In one embodiment of the invention, the fuel composition as described above is supplied as an anolyte, that is, an electrolytic liquid is added in addition to the primary and auxiliary fuel. The preferred electrolytic liquid is a basic aqueous solution, preferably of an alkali metal hydroxide, such as KOH The alkali metal hydroxide concentration in the anolyte is typically between 2 and 12 M. In the art, 6 M KOH has been shown to be ideal for fuel cell operation at ambient temperatures The addition of the electrolytic liquid has a positive effect on ion mobility within the anolyte fuel and helps ensure the stability of the auxiliary fuel component of the fuel. When considering the exact composition of the fuel composition of the invention when supplied as an anolyte, factors such as stability and solubility are taken into account.

A fair reading (i.e., without hindsight) of these passages merely teaches the person of ordinary skill in the art that borohydride compounds tend to decompose in acidic and neutral media but are stable in basic media. Clearly, these passages neither teach nor suggest that there is a relationship between degree of basicity and stability of the borohydride.

At any rate, even if one were to assume, *arguendo*, that one of ordinary skill in the art would suspect that a relationship between degree of basicity and stability of the borohydride exists, it is not seen why one of ordinary skill in the art would assume that the stability of the borohydride can be significantly increased beyond the stability achievable with a 6 M KOH solution, i.e., the solution which according to FINKELSHTAIN has been shown to be ideal for (direct liquid) fuel cell operation at ambient temperature. Specifically, a 6 M KOH solution must be considered to be extremely basic (about 330 g of KOH per liter) with a pH of 14 (or even higher). This also applies to the other anolytes, i.e., those having an alkali metal hydroxide concentration of between 2 M and 12 M. Even an anolyte having an alkali metal hydroxide concentration of 2 M can safely be assumed to be extremely basic and to have a pH of 14 (or higher).

In other words, FINKELSHTAIN neither teaches nor suggests that there would be any benefit in increasing the KOH concentration of the borohydride fuel which already contains about 330 g KOH per liter, let alone a benefit in terms of the stability of the borohydride. Accordingly, there would be no motivation for one of ordinary skill in the art to increase the concentration of KOH in the fuel beyond 6 M (or even beyond 2 M), let alone to at least about 7 M as recited in, e.g. independent claim 70.

Moreover, even if one were to assume, *arguendo*, that FINKELSHTAIN suggests that an incremental stability increase may be achievable (FINKELSHTAIN clearly does not teach or suggest this), one of ordinary skill in the art would also take into account that preparing a fuel concentrate having a KOH concentration of > 6 M and the dilution thereof to the desired concentration of 6 M KOH would entail extra work and effort (and thus cost) which would not be outweighed by a possibly achievable minor increase in fuel stability. Accordingly, FINKELSHTAIN does not provide any motivation whatsoever to prepare a fuel concentrate for a direct liquid fuel cell and to dilute this concentrate with a solvent before use, let alone discloses a corresponding process.

3. FINKELSHTAIN in View of PECSOK Teaches Away from Claims 70-83 and 132-134

In an attempt to support the contention that one of ordinary skill in the art would be motivated to increase the basicity of the 6 M KOH fuel of FINKELSHTAIN in order to increase the stability of the borohydride the Examiner relies on PECSOK. PECSOK indeed appears to disclose that there is a relationship between degree of basicity and stability of the borohydride. However, the results described by PECSOK relate to a weakly alkaline pH range, i.e., to a much lower pH than that present in the fuels of FINKELSHTAIN (14 or even higher).

For example, Fig. 1 at page 2863 of PECSOK is a graphic representation of the results obtained for the decomposition of sodium borohydride as a function of time and pH. As can be taken from the legend of Fig. 1 of PECSOK the experiments were carried out in the pH range from 7.7 (curve A) to 9.5 (curve E).

Already at pH 9.5 (curve E) the decomposition of sodium borohydride appears to be very slow.

Further, in the last paragraph of the left column of page 2862 of PECSOK it is mentioned that sodium borohydride solutions stored at pH 12 (0.01 M sodium hydroxide) decomposed only a few tenths of a percent per day. This statement in combination with the results illustrated in Fig. 1 of PECSOK makes it readily apparent to one of ordinary skill in the art that the stability of a borohydride in a solution which contains 6 M KOH, i.e., 600 times the concentration of hydroxide ions of a solution which according to PECSOK resulted in a borohydride decomposition of only a few tenths of a percent per day, should be very high and that further increasing the concentration of hydroxide ions beyond 6 M cannot reasonably be expected to result in a further significant increase in the stability of the borohydride.

Appellants submit that in view of the foregoing a combination of the teachings of FINKELSHTAIN and PECSOK makes it even clearer to one of ordinary skill in the art than the disclosure of FINKELSHTAIN alone (if possible at all) that there is no reason whatsoever to be concerned about borohydride stability in the 6 M KOH fuel (or even the 2 M KOH fuel) of FINKELSHTAIN. Accordingly, there is no motivation at all to go to the extra trouble of preparing a fuel concentrate and dilute the same before use.

In fact, a combination of the teachings of FINKELSHTAIN and PECSOK may even be considered to teach away from claims 70-83 and 132-134 because FINKELSHTAIN teaches that a 6 M KOH borohydride fuel is preferred and PECSOK strongly suggests that increasing the

hydroxide ion concentration beyond 6 M will not significantly increase the stability of the borohydride.

4. AMENDOLA Is Unable to Change the Combined Teachings of FINKELSHTAIN and PECSOK

The passages of AMENDOLA which are relied on by the Examiner in the rejection of claims 70-83 and 132-134 are paragraphs [0032] and [0033]. These paragraphs state (emphases added):

[0032] Since two water molecules are consumed for each borohydride molecule according to reaction (1) $[BH_4^- + 2 H_2O \rightarrow BO_2^- + 4 H_2]$, the concentration of all the remaining components (the cation, the borate, and the borohydride) will increase as the reaction continues. Therefore, twice as many water molecules as borohydride molecules are needed to sustain a constant rate of reaction. This excess water can be provided to the reaction in two ways: (i) charging the initial metal hydride solution with excess water, i.e., starting with a dilute solution, or (ii) adding more water from a separate source during or after the reaction. The second alternative is preferred to minimize the initial starting weight of water plus borohydride. Adding water from a separate source during or after the reaction is viable because the main byproduct of hydrogen oxidation in a hydrogen-consuming device is water. A hydrogen-consuming device, as used herein, means a device that uses hydrogen as a fuel, e.g., a fuel cell, combustion engine, or a gas turbine. Thus, water generated from the hydrogen-consuming device can be added to the borohydride solution. Assuming that water is recycled from the fuel cell or engine, 8 weight units of hydrogen (4 from water and 4 from borohydride) can come from 22 weight units of lithium borohydride. ... Therefore, the hydrogen generation system can include a slurry tank to store the borohydride and an adjacent mixing tank to add additional water obtained from the exhaust of the hydrogen consuming device, thereby allowing complete reaction of the borohydride while preventing the borohydride solution from drying out, i.e., preventing the components of the borohydride solution from precipitating out of solution.

[0033] The metal hydride solutions of the present invention include at least one stabilizing agent, since aqueous borohydride solutions slowly decompose unless stabilized. A stabilizing agent, as used herein, is any component which retards, impedes, or prevents the reaction of metal hydride with water. Typically, effective stabilizing agents maintain metal hydride solutions at a room temperature (b 25C.) pH of greater than about 7, preferably

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greater than about 11, more preferably greater than about 13, and most preferably greater than about 14.

The above passages make it clear that AMENDOLA is concerned with generating hydrogen as fuel for, *inter alia*, fuel cells. (According to its abstract, AMENDOLA relates to the use of borohydride based solutions as a hydrogen storage source and a catalyst system to release hydrogen therefrom.) This is in direct contrast to the teaching of FINKELSHTAIN which uses a borohydride fuel for a direct liquid fuel cell, i.e., uses a borohydride based solution not merely indirectly as a hydrogen storage source for a hydrogen-based fuel cell but directly as the actual fuel for the fuel cell.

In other words, the reaction on which the invention of AMENDOLA is based, i.e., $\text{BH}_4^- + 2 \text{H}_2\text{O} \rightarrow \text{BO}_2^- + 4 \text{H}_2$, is an undesired side reaction of the liquid fuel of FINKELSHTAIN (see paragraph [0018] of FINKELSHTAIN reproduced above). For this reason alone, there is no motivation for one of ordinary skill in the art to combine the teachings of FINKELSHTAIN and AMENDOLA.

Further, even if one were to assume, *arguendo*, that there is motivation to combine the teachings of FINKELSHTAIN (and PECSOK) and AMENDOLA, it is not seen how one of ordinary skill in the art could have arrived at the invention recited in present claims 70-83 and 132-134 thereby.

Particularly the above underlined passages of paragraph [0032] of AMENDOLA make it clear that AMENDOLA neither teaches nor suggests providing a borohydride containing concentrate and diluting the concentrate with a polar solvent to prepare a fuel for a (direct liquid)

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fuel cell, let alone for the purpose of reducing the decomposition of a fuel for a direct liquid fuel cell as recited in claim 132.

In particular, according to AMENDOLA the need for adding solvent (water) to the borohydride solution used for the generation of hydrogen results from the stoichiometry of the reaction according to which water is consumed at a rate which is twice as high as the consumption of the borohydride in the solution. This means that as the reaction (hydrogen generation) proceeds, the concentration of the borohydride in the solution increases, an undesired effect which is counteracted by introducing water into the borohydride solution tank. This water is advantageously the water that is produced by the hydrogen consuming device, e.g., a fuel cell (according to the reaction $2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O}$). In other words, according to AMENDOLA, the water for the dilution of the borohydride solution is preferably not even present at the beginning of the reaction (where there is no need for it because there is still enough water present), but is added to an already used, water-depleted borohydride solution during or after the reaction, i.e., during or after the use of the solution for the generation of hydrogen.

Paragraph [0033] of AMENDOLA does mention that a (premature) decomposition of the borohydride solution can be prevented by compounds which can keep the pH of the solution greater than about 7 and most preferably greater than about 14. However, as set forth above, the 6 M KOH fuel (or even the 2 M KOH fuel) of FINKELSHTAIN should already have a pH of 14 or greater, wherefore AMENDOLA fails to provide any motivation to increase the KOH concentration of the fuel of FINKELSHTAIN to more than 6 M (or even 2 M).

In this regard, it also is pointed out that from paragraphs [0078] and [0079] of AMENDOLA it can be taken that the highest concentration of alkali metal hydroxide used in the {P24712 00179184.DOC}

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- Examples of AMENDOLA is 10 % by weight of NaOH, which is about 2.5 M NaOH, i.e., significantly below the hydroxide ion concentration of the fuel which according to FINKELSHTAIN affords the best results (6 M).

In view of the foregoing, Appellants submit that AMENDOLA in combination with FINKELSHTAIN (and PECSOK) is unable to render obvious the subject matter of claims 70-83 and 132-134.

Accordingly, for at least all of the foregoing reasons, the Examiner has failed to establish a *prima facie* case of obviousness of the subject matter of present claims 70 and 132 and the claims dependent therefrom in view of FINKELSHTAIN, either alone or in combination with AMENDOLA and PECSOK.

C. Claims 84-97, 99, 101-116, 119-130 and 135-139 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over FINKELSHTAIN or Being Obvious Over FINKELSHTAIN/AMENDOLA/PECSOK

1. Summary of Rejection

The rejection is based on the Examiner's allegations with respect to claims 70-83 and 132-134 set forth above. Specifically, the rejection asserts that FINKELSHTAIN "either enables the ordinary artisan to immediately envisage the employment of, or to be motivated by suggestion to employ, the expedient of increasing the basicity to obtain a desired level of stability, and further to dilute such mixture to obtain the suggested 6M concentration in use." The rejection further alleges that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to 'package' or 'container' the obvious or anticipated storage stable

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concentrate along with a package or container containing the necessary solvent for obtaining the acknowledged optimal 6M fuel mixture and appropriate instructions because: (1) such avoids problems of dosing the proper amounts of the two components by the end user; (2) such avoids problems of dosing with impure solvent.”

2. Response

Appellants submit that, as set forth in detail in sections VII.B.2. to VII.B.4. above, FINKELSHTAIN alone or in combination with AMENDOLA and PECSOK fails to render it obvious to prepare a (any) fuel concentrate for making a fuel for a direct liquid fuel cell. Accordingly, these documents also are unable to render it obvious to provide one or more containers which hold the fuel concentrate and a diluent which in combination with the concentrate affords the actual fuel for the direct liquid fuel cell.

For this reason alone, the Examiner has failed to establish a *prima facie* case of obviousness of the subject matter of present claims 84, 101, 119 and 135 and the claims dependent therefrom in view of FINKELSHTAIN, either alone or in combination with AMENDOLA and PECSOK.

D. Claims 70-83 and 132-134 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over SUDA or SUDA/AMENDOLA

1. Summary of Rejection

The rejection relies to Example 1 of SUDA which allegedly discloses a composition comprising about 7.5 M KOH and 2 weight % KBH₄. The rejection further relies on paragraph

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[0050] of SUDA which mentions concentrations of the metal-hydrogen complex compound dissolved in an aqueous alkaline solution in the range of from 0.1 to 50 % by weight and asserts that in view thereof, it would allegedly have been obvious to one of ordinary skill in the art “to have employed anywhere within the ranges suggested [by SUDA], and to have made less concentrated ones from more concentrated ones as an obvious expedient”. To the extent that the claims require a pH not suggested by SUDA, the rejection relies on paragraphs [0033] and [0032] of AMENDOLA which allegedly suggest that a higher pH is more effective and allegedly suggest starting with a concentrated solution and adding water during use.

2. SUDA Does Not Render Obvious Claims 70-83 and 132-134

Appellants submit that SUDA does not provide any motivation to first prepare a fuel concentrate and to then dilute the concentrate to prepare a fuel for use in a direct liquid fuel cell. On the contrary, SUDA even teaches away from such expenditure. Specifically, in paragraph [0049] of SUDA the following is stated (emphasis added):

[0049] The aqueous alkaline solution contains the above-mentioned alkaline compound in a concentration of at least 5% by weight or, preferably, at least 10% by weight. Although the concentration of the alkaline compound has no definite upper limit up to the saturation concentration, the concentration should practically not exceed 30% by weight because of the limited solubility behavior of the metal-hydrogen complex compound in the aqueous alkaline solution when the alkali concentration is excessively high.

The above statement (which is in accordance with the Examples of AMENDOLA) clearly teaches that a hydroxide concentration above 30 % by weight is to be avoided and thereby provides a disincentive rather than a motivation to prepare a concentrate with a higher

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hydroxide ion concentration than that of the desired mixture if this concentrate is to be diluted later, anyway. In this regard, it also is noted that the above statements appear to be in line with Example 1 of SUDA wherein a 30 % by weight KOH solution contains KBH_4 in only a relatively low concentration, i.e., 2 % by weight.

Further, SUDA does not contain any teaching or suggestion to the effect that despite the disadvantage pointed out therein, for other reasons it may overall be advantageous to use relatively high hydroxide ion concentrations. Certainly SUDA does not teach or suggest that in order to stabilize the borohydride solution over extended periods of time the hydroxide ion concentration should be high. As taught in paragraph [0049] of SUDA, a concentration of alkaline compound of as low as 5 % by weight is already acceptable (also in accordance with the Examples of AMENDOLA).

Further, Appellants point out that the Examiner's reliance on the statement in paragraph [0050] of SUDA is obviously based on hindsight. Specifically, paragraph [0050] states (emphases added):

[0050] The concentration of the metal-hydrogen complex compound dissolved in the aqueous alkaline solution is selected usually in the range from 0.1 to 50% by weight in consideration of the desired power generating capacity of the liquid fuel cell and the solubility behavior of the complex compound in the aqueous alkaline solution. When improvement is desired in the ionic conductivity of the aqueous alkaline solution of which the alkaline compound is not lithium hydroxide, it is optional that the solution is admixed with a small amount or, for example, 0.01 to 0.1% by weight of lithium hydroxide.

A fair reading of the above paragraph merely informs the reader of the concentration range for the metal-hydrogen complex (i.e., usually from 0.1 to 50 percent by weight) which the inventor of SUDA considers to be suitable for the liquid fuel described therein. According to SUDA, the indicated range is suitable "in consideration of the desired power generating capacity

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of the liquid fuel cell and the solubility behavior of the complex compound in the aqueous alkaline solution". In other words, one of ordinary skill in the art would understand this statement to merely mean that lower concentrations of the metal-hydrogen complex than 0.1 % by weight would usually not afford the desired power generating capacity and higher concentrations than 50 % by weight would usually result in problems with respect to the dissolution of the complex compound in the aqueous alkaline solution.

Clearly, it corresponds to usual practice to indicate suitable concentration ranges of compounds described in patent applications (and to give the reasons therefor). In fact, SUDA appears to indicate concentration ranges not only for the metal-hydrogen complex, but also for other compounds and components which are necessary or at least desirable for carrying out the invention disclosed therein. See, e.g., paragraphs [0049] and [0055] of SUDA.

Appellants submit that the mere indication that a certain concentration range is suitable does not automatically provide a motivation to prepare a composition having a concentration within the indicated range and to dilute this composition in order to obtain one or more less concentrated compositions within the indicated range.

SUDA does not contain any invitation whatsoever to proceed in the manner envisaged by the Examiner (i.e., to prepare one or more dilutions of a stock solution), and neither is a corresponding procedure described in any of the Examples of SUDA (or in any of the other documents cited by the Examiner).

For at least all of the foregoing reasons, SUDA fails to render obvious the subject matter of any of claims 70-83 and 132-134.

3. SUDA in View of AMENDOLA Does Not Render Obvious Claims 70-83 and 132-134

AMENDOLA does not add anything to the disclosure of SUDA discussed in the preceding section. The 7.5 M KOH solution of Example 1 of SUDA postulated by the Examiner can safely be assumed to have a pH of 14 or greater, i.e., the most preferred pH according to paragraph [0033] of AMENDOLA. Further, as pointed out above, the highest hydroxide ion concentration used in the Examples of AMENDOLA is only about 2.5 M.

Further, it has already been set forth in detail above (see section VII.B.4.) that paragraph [0032] of AMENDOLA relates to a situation which is specific to the hydrogen generation reaction described therein, i.e., the more hydrogen has already been generated by the decomposition (hydrolysis) of the borohydride the higher will be the concentration of the borohydride in the solution due to the fact that the reaction consumes two moles of water per one mole of borohydride. This has nothing to do with the initial preparation of a fuel concentrate which is diluted before use to prepare a fuel for a direct liquid fuel cell.

Even further, it is noted that present independent claim 132 is drawn to a method of reducing the decomposition of a fuel for a direct liquid fuel cell during storage of the fuel. Neither SUDA nor AMENDOLA are directed to corresponding subject matter, which is yet another reason why these documents are unable to render obvious the subject matter of present claims 132 and the claims dependent therefrom.

Appellants submit that for at least all of the foregoing reasons, the Examiner has failed to establish a *prima facie* case of obviousness of the subject matter of present claims 70 and 132 and the claims dependent therefrom in view of SUDA in combination with AMENDOLA.

E. Claims 70-83 and 132-134 Are Not Properly Rejected under 35 U.S.C. § 102 (e) or 103(a) As Being Anticipated by or Obvious Over TSANG I or Being Obvious Over TSANG I/AMENDOLA

1. Summary of Rejection

The rejection alleges that TSANG I “discloses the production of two solutions, one comprising metal boro-hydride, water, and hydroxide, the other comprising water, which are then combined thus diluting each and which then forms a mixture used as a fuel in a fuel cell (column 1, lines 42 to column 2, line 34, column 3, line 54 to column 4, line 45)”.

The rejection further asserts that in the event the reference is deemed to be of not sufficient specificity to sustain a conclusion of anticipation, it would allegedly have been obvious to one of ordinary skill in the art “to have selected proportions of components within the limits disclosed to determine the workable limitations.”

To the extent that the claims require a pH not suggested by TSANG I, the rejection relies on paragraphs [0033] and [0032] of AMENDOLA which allegedly suggest that a higher pH is more effective and allegedly suggest starting with a concentrated solution and adding water during use.

2. TSANG I Neither Anticipates Nor Renders Obvious Claims 70-83 and 132-134

Appellants note that TSANG I neither teaches nor suggests to prepare a fuel concentrate for a direct liquid fuel cell, let alone to dilute this concentrate before use in order to prepare a fuel for a direct liquid fuel cell.

Appellants fail to see where in TSANG I it is disclosed that the “mixture” referred to by the Examiner is used as a fuel in a (direct liquid) fuel cell. TSANG I makes it abundantly clear that this “mixture” is not used as a fuel, let alone as a fuel in a fuel cell, but merely serves as a source of hydrogen gas. That is, the borohydride in the corresponding mixture, when contacted in a reaction chamber with a suitable catalyst, is decomposed to form, *inter alia*, hydrogen which in turn is transferred to a hydrogen-based fuel cell and used therein as the actual fuel. In this regard, the title, the abstract and col. 4, lines 54-61 of TSANG I may, for example, be referred to.

In comparison, present independent claims 70 and 132 are drawn to “a process for preparing a metal hydride containing liquid for use as a fuel in a direct liquid fuel cell from a storage-stable concentrate” and “a method of reducing the decomposition of a fuel for a direct liquid fuel cell during storage of the fuel”, respectively. In other words, the metal hydride containing compositions of independent claims 70 and 132 are the actual fuel, i.e., not just a means for generating hydrogen which in turn can be used in a fuel cell which operates with hydrogen as the fuel.

Appellants note that the indication of the intended use of the fuel concentrate recited in the independent method claims 70 and 132, i.e., for preparing a fuel for a direct liquid fuel cell, implies certain characteristics of the fuel and the fuel concentrate, respectively which do not have to be present in a fuel (concentrate) which is used merely for the generation of hydrogen. For example, it is apparent that a fuel that is to be used directly (as such) in a fuel cell (i.e., not indirectly by generating hydrogen therefrom first) must not contain impurities which would cause significant harm to the (interior of the) fuel cell and/or the feeding device for the fuel possibly associated therewith (e.g., corrosion) and/or would poison the oxidation catalyst of the

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anode of the liquid fuel cell. This anode catalyst is to catalyze, e.g., the reaction depicted in paragraph [0004] of the present specification and is to prevent, e.g., the reaction depicted in paragraph [0005] of the present specification (generation of hydrogen gas) to as high a degree as possible. The catalyst of TSANG I, on the other hand, catalyzes the reaction depicted in paragraph [0006] of the present specification.

In contrast, a metal hydride composition that is used merely for the generation of hydrogen by catalytic decomposition of the metal hydride may contain impurities which would not usually be acceptable if the fuel were to be used directly inside the fuel cell (because essentially only the hydrogen gas generated therefrom will eventually reach the inside of the fuel cell).

Also, a metal hydride composition for use as a hydrogen generator may have a much higher concentration of the components thereof than a fuel that is to be supplied directly to a fuel cell and must be used therein as such. In other words, a high viscosity of the fuel is much more acceptable when the fuel is to be used for the generation of hydrogen gas instead of as the actual fuel that is to be oxidized at the anode of the fuel cell. For example, a fuel concentrate which would not be suitable as such (i.e., in undiluted form) for use in a direct liquid fuel cell may be quite acceptable as source for the generation of hydrogen.

3. TSANG I in View of AMENDOLA Does Not Render Obvious Claims 70-83 and 132-134

AMENDOLA does not cure the deficiencies of TSANG I pointed out above. Specifically, like TSANG I, AMENDOLA is directed to the use of a borohydride solution for generating

- hydrogen for use as fuel in, e.g., a hydrogen-based fuel cell. This has nothing to do with a fuel for use in a direct liquid fuel cell as recited in the rejected claims.

Moreover, AMENDOLA does not add anything to the disclosure of TSANG I. A 40 % alkali hydroxide or alkaline metal hydroxide solution as mentioned in claim 1 of TSANG I can safely be assumed to have a pH of greater than 14, i.e., the most preferred pH according to paragraph [0033] of AMENDOLA. It also is again noted that the highest alkali hydroxide concentration used in the Examples of AMENDOLA is only 10 % by weight of NaOH.

Further, it has already been set forth in detail above (see section VII.B.4.) that paragraph [0032] of AMENDOLA relates to a situation which is specific to the hydrogen generation reaction described therein and in TSANG I, i.e., the more hydrogen has already been generated by the decomposition (hydrolysis) of the borohydride the higher will be the concentration of the borohydride in the solution due to the fact that the reaction consumes two moles of water per one mole of borohydride. This has nothing to do with the initial preparation of a fuel concentrate which is diluted before use to prepare a fuel for a direct liquid fuel cell.

Further, it is noted that present independent claim 132 is drawn to a method of reducing the decomposition of a fuel for a direct liquid fuel cell during storage of the fuel. Neither TSANG I nor AMENDOLA are directed to corresponding subject matter, which is yet another reason why these documents are unable to render obvious the subject matter of present claims 132 and the claims dependent therefrom.

Appellants submit that for at least all of the foregoing reasons, the Examiner has failed to establish a *prima facie* case of obviousness of the subject matter of present claims 70 and 132

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- and the claims dependent therefrom in view of TSANG I, either alone or in combination with AMENDOLA.

F. Claims 84-97, 99, 101-116, 119-130 and 135-139 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over TSANG I or TSANG II or Being Obvious Over TSANG I/AMENDOLA or TSANG II/ AMENDOLA

1. Summary of Rejection

The rejection states that TSANG I and TSANG II are equivalent but have different effective publication dates. The rejection alleges that TSANG I or TSANG II “either enables the ordinary artisan to immediately envisage the employment of, or to be motivated by suggestion to employ, the expedient of increasing the basicity to obtain a desired level of stability, and further to dilute such mixture to obtain the suggested 6M concentration in use.” The rejection further alleges that “[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to ‘package’ or ‘container’ the obvious or anticipated storage stable concentrate along with a package or container containing the necessary solvent for obtaining the acknowledged optimal 6M fuel mixture and appropriate instructions because: (1) such avoids problems of dosing the proper amounts of the two components by the end user; (2) such avoids problems of dosing with impure solvent.”

To the extent that the claims require a pH not suggested by TSANG I/TSANG II, the rejection relies on paragraphs [0033] and [0032] of AMENDOLA which allegedly suggest that a higher pH is more effective and allegedly suggest starting with a concentrated solution and adding water during use.

2. TSANG I and TSANG II Do Not Render Obvious Claims 84-97, 99, 101-116, 119-130 and 135-139

As an initial matter, Appellants note that rejection of claims 84-97, 99, 101-116, 119-130 and 135-139 over TSANG I/ TSANG II refers to “the suggested 6M concentration” and “the acknowledged optimal 6M fuel mixture”. Appellants are unable to find corresponding statements in TSANG I/TSANG II and assume that the corresponding passages have merely been copied from the sections with refer to the rejections over FINKELSHTAIN.

The rejection of claims 84-97, 99, 101-116, 119-130 and 135-139 over TSANG I/ TSANG II is based on an incorrect assumption regarding the alleged anticipation/obviousness of the subject matter of claims 70-83 and 132-134 by TSANG I (see section VII.E.2. above). In particular, the Examiner incorrectly assumes that the metal borohydride containing “mixture” of TSANG I/TSANG II is used (as such) as a fuel for a fuel cell. However, as explained above, the mixture of TSANG I/TSANG II serves merely as a means for storing hydrogen gas from which the latter is liberated by catalyzing the decomposition of the borohydride. This is one of the reasons why one of ordinary skill in the art would not be motivated to “package” or “container” the first and second solutions referred to in, for example, claim 1 of TSANG I.

As noted, the “mixture” of TSANG I/TSANG II which can be made from the first and second solutions is not employed as fuel but is merely used to generate hydrogen for a hydrogen-based fuel cell. In order to generate hydrogen, the “mixture” has to be contacted with a catalyst. The contacting of the “mixture” with a catalyst and the handling (e.g. transfer) of the resultant hydrogen gas apparently require equipment which is complex and of a considerable size. Also, the amount (volume) of the “mixture” which is required to generate an amount of hydrogen gas

which is sufficient for operating a technically useful hydrogen-based fuel cell is considerable (in this regard, it is noted that according to col. 3, lines 54-61 of TSANG I, at a concentration of 20 wt % of NaBH_4 , solution A has a hydrogen content of (only) 6 wt %). Furthermore, a corresponding process would likely be operated continuously, rendering a prepackaged amount of the “mixture” virtually useless.

TSANG I/TSANG II fail to motivate one of ordinary skill in the art would to (pre)package Solution A and Solution B described therein in the way recited in present independent claims 84, 101, 119 and 135. In this regard, the passage from col. 4, line 35 to col. 5, line 11, TSANG I may, for example, be referred to. This passage states (emphases added):

The best mode to practice the embodiments disclosed herein is to meter the NaBH_4 solution (Solution A) and the second aqueous solution (Solution B) independently by two separate mechanical devices, i.e., pumps, into a chamber that contains the catalyst. ... To further accelerate the reaction rate, the reaction chamber may also be heated externally by a capacitor or other electronic device.

FIG. 1 depicts schematically a PEM fuel cell 10 employing the teachings herein. ...

Oxygen and/or air is introduced to the cathode 12, while hydrogen gas is introduced to the anode 14. Hydrogen gas is generated in a reaction chamber 20, using a catalyst (not shown). In the reaction chamber, aqueous sodium borohydride, exposed to the catalyst, generates hydrogen gas and sodium borate, as described above. Hydrogen from the reaction chamber 20 is then introduced into the PEM fuel cell 10.

In accordance with the teachings herein, Solution A, comprising sodium borohydride in water, and Solution B, comprising water, and the optional water-soluble additive, are combined in the reaction chamber 20. Solution A is contained in reservoir 22, while Solution B is contained in reservoir 24. A metering pump/valve 26 meters out the desired volume of Solution A into the reaction chamber 20, while metering pump/valve 28 meters out the desired volume of Solution B into the reaction chamber. Thus, Solutions A and B are metered separately from separate reservoirs 22, 24 and mixed within the reaction chamber 20.

In another embodiment, the reaction chamber is heated, using an external heating mechanism 30, to increase the reaction rate of the Solutions A and B in the presence of the catalyst. The temperature to which the reaction chamber is heated is advantageously less than the boiling points of the two solutions.

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Clearly, the above statements refer to an operation on an industrial scale where the use of containers like those recited in the rejected claims would not make sense already for the reason that due to the large volumes of solutions A and B involved, corresponding containers which are either prepacked or contain solutions A and B in different compartments thereof would have to be large and thus, difficult and burdensome to handle and transport.

Further, if one were to assume that the process described in TSANG I/TSANG II is operated on a scale which would make the use of containers like those recited in the rejected claims feasible, it is not seen that this would be an economical process. The containers and thus, the amount of hydrogen that could be generated from the contents of these containers would apparently be small and probably not be suitable for even only the batchwise operation of complex equipment that apparently is needed for transferring the generated hydrogen (i.e., a highly flammable gas) from the reaction chamber to the fuel cell.

Accordingly, there is no motivation for one of ordinary skill in the art to (pre)package the solutions of TSANG I/TSANG II for mixing before use and to provide corresponding containers, respectively.

3. TSANG I/TSANG II in View of AMENDOLA Do Not Render Obvious Claims 84-97, 99, 101-116, 119-130 and 135-139

AMENDOLA does not cure the deficiencies of TSANG I/TSANG II pointed out above. Specifically, like TSANG I/TSANG II, AMENDOLA is directed to the use of a borohydride solution for generating hydrogen for use as fuel in, e.g., a hydrogen-based fuel cell. This has nothing to do with a fuel for use in a direct liquid fuel cell as recited in the rejected claims.

Moreover, AMENDOLA does not add anything to the disclosure of TSANG I/TSANG II. A 40 % alkali hydroxide or alkaline metal hydroxide solution as mentioned in claim 1 of TSANG I/TSANG II can safely be assumed to have a pH of greater than 14, i.e., the most preferred pH according to paragraph [0033] of AMENDOLA. Further, it has already been set forth in detail above (see section VII.B.4.) that paragraph [0032] of AMENDOLA relates to a situation which is specific to the hydrogen generation reaction described therein and in TSANG I/TSANG II I, i.e., the more hydrogen has already been generated by the decomposition (hydrolysis) of the borohydride the higher will be the concentration of the borohydride in the solution due to the fact that the reaction consumes two moles of water per one mole of borohydride. This has nothing to do with the initial preparation of a fuel concentrate which is diluted before use to prepare a fuel for a direct liquid fuel cell.

Appellants submit that for at least all of the foregoing reasons, the Examiner has failed to establish a *prima facie* case of obviousness of the subject matter of present claims 84-97, 99, 101-116, 119-130 and 135-139 and the claims dependent therefrom in view of TSANG I/TSANG II, either alone or in combination with AMENDOLA.

G. Claims 70-83 and 132-134 Are Not Properly Rejected under 35 U.S.C. § 102 (a) or 103(a) As Being Anticipated by or Obvious Over TSANG II or Being Obvious Over TSANG II/AMENDOLA

1. Summary of Rejection

The rejection is essentially identical to the rejection of claims 70-83 and 132-134 under 35 U.S.C. § 102 (e) or 103(a) over TSANG I or TSANG I in view of AMENDOLA summarized

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above in section VII.E.1. (as set forth at page 14 of the Final Office Action, TSANG I and TSANG II are equivalent but have different effective publication dates).

2. Response to Rejection

Appellants submit that for at least all of the reasons set forth above in sections VII.E.2. and VII.E.3. with respect to TSANG I the Examiner has failed to establish that TSANG II anticipates any of the rejected claims and also has failed to establish a *prima facie* case of obviousness of the subject matter of present claims 70 and 132 and the claims dependent therefrom in view of TSANG II, either alone or in combination with AMENDOLA.

H. Claims 96, 97, 99, 102, 105, 106, 115, 130 and 139 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over FINKELSHTAIN or Being Obvious Over FINKELSHTAIN/AMENDOLA/PECSOK

1. Claims 96 and 115 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over FINKELSHTAIN or Being Obvious Over FINKELSHTAIN/AMENDOLA/PECSOK

Even if one were to assume, *arguendo*, that FINKELSHTAIN either alone or in view of AMENDOLA and further in view of PECSOK renders obvious the subject matter of independent claims 84 and 101, this would not apply to claim 96 (which depends from claim 84) and claim 115 (which through claims 113, 111 and 110 depends from claim 101). Both of these claims recite that the solvent in the at least one second compartment of the container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment comprises at least one additive for the fuel.

FINKELSHTAIN does not disclose a dilution of a fuel concentrate and consequently neither teaches nor suggests a solvent for diluting a fuel concentrate, let alone a solvent which comprises at least one additive for the fuel.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel concentrate, let alone a solvent which comprises at least one additive for a fuel of a direct liquid fuel cell.

PECSOK merely describes polarographic studies on the oxidation and hydrolysis and sodium hydride (see, e.g., title) and has nothing to do with solvents for forming a fuel for a direct liquid fuel cell from a fuel concentrate, let alone a solvent which comprises at least one additive for a corresponding fuel.

2. Claims 97 and 130 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over FINKELSHTAIN or Being Obvious Over FINKELSHTAIN/AMENDOLA/PECSOK

Even if one were to assume, *arguendo*, that FINKELSHTAIN either alone or in view of AMENDOLA and further in view of PECSOK renders obvious the subject matter of independent claims 84 and 119, this would not apply to claim 97 (which depends from claim 96 which in turn depends from claim 84) and claim 130 (which depends from claim 119). Both of these claims recite that the solvent for diluting the fuel concentrate comprises at least one additive selected from plasticizers, detergents and antifreeze.

FINKELSHTAIN does not disclose a dilution of a fuel concentrate and consequently neither teaches nor suggests a solvent for diluting a fuel concentrate, let alone a solvent which comprises at least one additive selected from plasticizers, detergents and antifreeze.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel concentrate, let alone a solvent which comprises at least one additive selected from plasticizers, detergents and antifreeze.

PECSOK merely describes polarographic studies on the oxidation and hydrolysis and sodium hydride (see, e.g., title) and has nothing to do with solvents for forming a fuel for a direct liquid fuel cell from a fuel concentrate, let alone with a solvent which comprises at least one additive selected from plasticizers, detergents and antifreeze.

3. Claims 99 and 102 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over FINKELSHTAIN or Being Obvious Over FINKELSHTAIN/AMENDOLA/PECSOK

Even if one were to assume, *arguendo*, that FINKELSHTAIN either alone or in view of AMENDOLA and further in view of PECSOK renders obvious the subject matter of independent claims 84 and 101, this would not apply to claim 99 (which depends from claim 84) and claim 102 (which depends from claim 101). Both of these claims recite that the container which comprises fuel concentrate in a first compartment and (polar) solvent for diluting the fuel concentrate in at least one second compartment allows a mixing of the concentrate and the solvent inside the container.

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FINKELSHTAIN does not disclose a dilution of a fuel concentrate and consequently neither teaches nor suggests a solvent for diluting a fuel concentrate, let alone a container which comprises fuel concentrate in a first compartment and (polar) solvent for diluting the fuel concentrate in at least one second compartment and allows a mixing of the concentrate and the solvent inside the container.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel concentrate, let alone a container which comprises fuel concentrate in a first compartment and (polar) solvent for diluting the fuel concentrate in at least one second compartment and allows a mixing of the concentrate and the solvent inside the container.

PECSOK merely describes polarographic studies on the oxidation and hydrolysis and sodium hydride (see, e.g., title) and has nothing to do with solvents for forming a fuel for a direct liquid fuel cell from a fuel concentrate, let alone with a container which comprises fuel concentrate in a first compartment and (polar) solvent for diluting the fuel concentrate in at least one second compartment and allows a mixing of the concentrate and the solvent inside the container.

4. Claims 105 and 106 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over FINKELSHTAIN or Being Obvious Over FINKELSHTAIN/AMENDOLA/PECSOK

Even if one were to assume, *arguendo*, that FINKELSHTAIN either alone or in view of AMENDOLA and further in view of PECSOK renders obvious the subject matter of independent claim 101, this would not apply to claims 105 and 106 (both of which depend from claim 101). Both of these claims recite that in the container which comprises fuel concentrate in a first compartment and (polar) solvent for diluting the fuel concentrate in at least one second compartment one of the compartments (the first or the at least one second compartment) at least partially surrounds the other compartment (the at least one second or the first compartment).

FINKELSHTAIN does not disclose a dilution of a fuel concentrate and consequently neither teaches nor suggests a solvent for diluting a fuel concentrate, let alone a container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment and wherein one of the compartments partially surrounds the other compartment.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel concentrate, let alone a container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment and wherein one of the compartments partially surrounds the other compartment.

PECSOK merely describes polarographic studies on the oxidation and hydrolysis and sodium hydride (see, e.g., title) and has nothing to do with solvents for forming a fuel for a direct

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liquid fuel cell from a fuel concentrate, let alone with a container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment and wherein one of the compartments partially surrounds the other compartment.

5. Claim 139 Is Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over FINKELSHTAIN or Being Obvious Over FINKELSHTAIN/AMENDOLA/PECSOK

Even if one were to assume, *arguendo*, that FINKELSHTAIN either alone or in view of AMENDOLA and further in view of PECSOK renders obvious the subject matter of independent claim 101, this would not apply to claim 139 which recites a process for filling a liquid fuel cell wherein the container of claim 101 (which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment) is used as filling device for the fuel cell.

FINKELSHTAIN does not disclose a dilution of a fuel concentrate and consequently neither teaches nor suggests a solvent for diluting a fuel concentrate, let alone a process for filling a liquid fuel cell wherein a container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment is used as filling device for the fuel cell.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel concentrate, let alone a process for filling a liquid fuel cell wherein a container which comprises

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fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment is used as filling device for the fuel cell.

PECSOK merely describes polarographic studies on the oxidation and hydrolysis and sodium hydride (see, e.g., title) and has nothing to do with solvents for forming a fuel for a direct liquid fuel cell from a fuel concentrate, let alone with a process for filling a liquid fuel cell wherein a container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment is used as filling device for the fuel cell.

I. Claims 96, 97, 99, 102, 105, 106, 130 and 139 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over TSANG I or TSANG II or Being Obvious Over TSANG I/AMENDOLA or TSANG II/ AMENDOLA

1. Claims 96 and 115 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over TSANG I or TSANG II or Being Obvious Over TSANG I/AMENDOLA or TSANG II/ AMENDOLA

Even if one were to assume, *arguendo*, that TSANG I or TSANG II either alone or in view of AMENDOLA render obvious the subject matter of independent claims 84 and 101, this would not apply to claim 96 (which depends from claim 84) and claim 115 (which through claims 113, 111 and 110 depends from claim 101). Both of these claims recite that the solvent in the at least one second compartment of the container which comprises a fuel concentrate in a first compartment for making a fuel for a direct liquid fuel cell and solvent for diluting the fuel concentrate and thereby forming the fuel in at least one second compartment comprises at least one additive for the fuel.

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TSANG I and TSANG II do not disclose a dilution of a fuel concentrate which is used for making a fuel for a direct liquid fuel cell and consequently neither teach nor suggest a solvent for diluting the fuel concentrate for forming the fuel, let alone a solvent which comprises at least one additive for the fuel.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel concentrate, let alone a solvent which comprises at least one additive for a fuel of a direct liquid fuel cell.

2. Claims 97 and 130 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over TSANG I or TSANG II or Being Obvious Over TSANG I/AMENDOLA or TSANG II/ AMENDOLA

Even if one were to assume, *arguendo*, that TSANG I or TSANG II either alone or in view of AMENDOLA render obvious the subject matter of independent claims 84 and 119, this would not apply to claim 97 (which depends from claim 96 which in turn depends from claim 84) and claim 130 (which depends from claim 119). Both of these claims recite that the solvent for diluting the fuel concentrate comprises at least one additive selected from plasticizers, detergents and antifreeze.

TSANG I and TSANG II do not disclose a dilution of a fuel concentrate which is used for making a fuel for a direct liquid fuel cell and consequently neither teach nor suggest a solvent for

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diluting the fuel concentrate for forming the fuel, let alone a solvent which comprises at least one additive selected from plasticizers, detergents and antifreeze.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel concentrate, let alone a solvent which comprises at least one additive selected from plasticizers, detergents and antifreeze.

3. Claims 99 and 102 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over TSANG I or TSANG II or Being Obvious Over TSANG I/AMENDOLA or TSANG II/ AMENDOLA

Even if one were to assume, *arguendo*, that TSANG I or TSANG II either alone or in view of AMENDOLA render obvious the subject matter of independent claims 84 and 101, this would not apply to claim 99 (which depends from claim 84) and claim 102 (which depends from claim 101). Both of these claims recite that the container which comprises fuel concentrate in a first compartment and (polar) solvent for diluting the fuel concentrate in at least one second compartment allows a mixing of the concentrate and the solvent inside the container.

TSANG I and TSANG II do not disclose a dilution of a fuel concentrate which is used for making a fuel for a direct liquid fuel cell and consequently neither teach nor suggest a solvent for diluting the fuel concentrate for forming the fuel, let alone a container which comprises fuel concentrate in a first compartment and (polar) solvent for diluting the fuel concentrate in at least one second compartment and allows a mixing of the concentrate and the solvent inside the container.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel concentrate, let alone a container which comprises fuel concentrate in a first compartment and (polar) solvent for diluting the fuel concentrate in at least one second compartment and allows a mixing of the concentrate and the solvent inside the container.

4. Claims 105 and 106 Are Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over TSANG I or TSANG II or Being Obvious Over TSANG I/AMENDOLA or TSANG II/ AMENDOLA

Even if one were to assume, *arguendo*, that TSANG I or TSANG II either alone or in view of AMENDOLA render obvious the subject matter of independent claim 101, this would not apply to claims 105 and 106 (both of which depend from claim 101). Both of these claims recite that in the container which comprises fuel concentrate in a first compartment and (polar) solvent for diluting the fuel concentrate in at least one second compartment one of the compartments (the first or the at least one second compartment) at least partially surrounds the other compartment (the at least one second or the first compartment).

TSANG I and TSANG II do not disclose a dilution of a fuel concentrate which is used for making a fuel for a direct liquid fuel cell and consequently neither teach nor suggest a solvent for diluting the fuel concentrate for forming the fuel, let alone a container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment and wherein one of the compartments partially surrounds the other compartment.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel concentrate, let alone a container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment and wherein one of the compartments partially surrounds the other compartment.

5. Claim 139 Is Not Properly Rejected under 35 U.S.C. § 103(a) As Being Obvious Over TSANG I or TSANG II or Being Obvious Over TSANG I/AMENDOLA or TSANG II/ AMENDOLA

TSANG I or TSANG II either alone or in view of AMENDOLA render obvious the subject matter of independent claim 101, this would not apply to claim 139 which recites a process for filling a liquid fuel cell wherein the container of claim 101 (which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment) is used as filling device for the fuel cell.

TSANG I and TSANG II do not disclose a dilution of a fuel concentrate which is used for making a fuel for a direct liquid fuel cell and consequently neither teach nor suggest a solvent for diluting the fuel concentrate for forming the fuel, let alone a process for filling a liquid fuel cell wherein a container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment is used as filling device for the fuel cell.

AMENDOLA fails to disclose the dilution of a fuel concentrate for forming a fuel for a direct liquid fuel cell and consequently also fails to teach or suggest a solvent for diluting a fuel

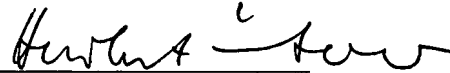
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concentrate, let alone a process for filling a liquid fuel cell wherein a container which comprises fuel concentrate in a first compartment and solvent for diluting the fuel concentrate in at least one second compartment is used as filling device for the fuel cell.

VIII. CONCLUSION

Appellants respectfully submit that for at least all of the foregoing reasons the Examiner has failed to establish that claims 70-83 and 132-134 are anticipated by any of FINKELSHTAIN, TSANG I or TSANG II and also has failed to establish a *prima facie* case of obviousness of any of the rejected claims 70-97, 99, 101-116, 119-130 and 132-139 with respect to FINKELSHTAIN, either alone or in view of AMENDOLA and PECSOK, with respect to SUDA in view of AMENDOLA or with respect to TSANG I or TSANG II, either alone or in view of AMENDOLA. The Board is, therefore, respectfully requested to reverse the Final Rejection, and to allow the application to issue in its present form.

Respectfully submitted,
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CLAIMS APPENDIX

70. A process for preparing a metal hydride containing liquid for use as a fuel in a direct liquid fuel cell from a storage-stable concentrate, wherein the process comprises combining (a) a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration of at least about 7 moles per liter, and not more than about 2 % of the at least one metal hydride compound decomposes when the concentrate is stored for 4 weeks at about 25°C, and (b) a solvent in an amount of at least about 15 % by volume of the concentrate.

71. The process of claim 70, wherein combining (a) and (b) results in a hydroxide ion concentration of not higher than about 6 moles per liter.

72. The process of claim 71, wherein not more than about 0.5 % of the at least one metal hydride compound decomposes when the concentrate is stored for 4 weeks at about 25°C.

73. The process of claim 71, wherein the concentrate comprises the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

74. The process of claim 73, wherein the hydroxide ion concentration in the concentrate is at least about 8 moles per liter.

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75. The process of claim 71, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , $\text{Be}(\text{BH}_4)_2$, $\text{Ca}(\text{BH}_4)_2$, $\text{Mg}(\text{BH}_4)_2$, NaCNBH_3 , LiH , NaH , KH , CaH_2 , BeH_2 , MgH_2 , NaAlH_4 , LiAlH_4 , and KAlH_4 .

76. The process of claim 70, wherein the at least one metal hydride compound comprises at least one of NaBH_4 and KBH_4 .

77. The process of claim 70, wherein the concentrate further comprises at least one of LiOH , NaOH , KOH , RbOH , CsOH , $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$, and NH_4OH .

78. The process of claim 77, wherein the solvent comprises at least one of water, methanol, ethanol, ethylene glycol, diethylene glycol, glycerol, acetone, methyl ethyl ketone, diethyl ketone, methyl acetate, ethyl acetate, dioxan, tetrahydrofuran, diglyme and triglyme.

79. The process of claim 74, wherein the concentrate comprises water, at least one of NaBH_4 and KBH_4 , and at least one of NaOH and KOH .

80. The process of claim 78, wherein the concentrate, if diluted to a hydroxide ion concentration of about 6 moles per liter, contains at least about 2 moles per liter of the at least one metal hydride compound.

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81. The process of claim 70, wherein the concentrate is substantially free of any additives which adversely affect the stability of the at least one metal hydride compound.

82. The process of claim 73, wherein the concentrate is substantially free of plasticizers, detergents and antifreeze.

83. The process of claim 70, wherein the concentrate is substantially free of any stabilizer for the at least one metal hydride compound which is different from a hydroxide ion providing compound.

84. A process for producing a packaged combination for making a fuel for use with a direct liquid fuel cell, the fuel comprising at least one metal hydride compound and a polar solvent and having a hydroxide ion concentration of not higher than about 7 moles per liter, wherein the process comprises providing a container having a first compartment and at least one second compartment, partially or completely filling the first compartment with a concentrate which differs from the fuel at least by comprising only a part of the polar solvent and by having a hydroxide ion concentration which is higher than the hydroxide ion concentration of the fuel, and partially or completely filling the at least one second compartment with an amount of polar solvent which in combination with the concentrate will afford the fuel.

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85. The process of claim 84, wherein combining the concentrate in the first compartment with the solvent in the at least one second compartment results in a fuel having a hydroxide ion concentration of not higher than about 6 moles per liter.

86. The process of claim 85, wherein the concentrate is such that not more than about 2 % of the at least one metal hydride compound decomposes when the concentrate is stored for 4 weeks at about 25°C.

87. The process of claim 85, wherein the concentrate contains the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

88. The process of claim 84, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , $\text{Be}(\text{BH}_4)_2$, $\text{Ca}(\text{BH}_4)_2$, $\text{Mg}(\text{BH}_4)_2$, NaCNBH_3 , LiH , NaH , KH , CaH_2 , BeH_2 , MgH_2 , NaAlH_4 , LiAlH_4 , and KAlH_4 .

89. The process of claim 88, wherein the concentrate further comprises at least one of LiOH , NaOH , KOH , RbOH , CsOH , $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$, and NH_4OH .

90. The process of claim 89, wherein the polar solvent comprises at least one of water, methanol, ethanol, ethylene glycol, diethylene glycol, glycerol, acetone, methyl ethyl ketone, diethyl ketone, methyl acetate, ethyl acetate, dioxan, tetrahydrofuran, diglyme and triglyme.

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91. The process of claim 87, wherein the concentrate comprises water, at least one of NaBH_4 and KBH_4 , and at least one of NaOH and KOH .

92. The process of claim 84, wherein combining the concentrate with the solvent in the at least one second compartment affords a fuel having a concentration of the at least one metal hydride compound of at least about 3 moles per liter.

93. The process of claim 84, wherein the concentrate is substantially free of any additives which adversely affect the stability of the at least one metal hydride compound.

94. The process of claim 84, wherein the concentrate is substantially free of plasticizers, detergents and antifreeze.

95. The process of claim 84, wherein the concentrate is substantially free of any stabilizer for the at least one metal hydride compound which is different from a hydroxide ion providing compound.

96. The process of claim 84, wherein the solvent in the at least one second compartment comprises at least one additive for the fuel.

97. The process of claim 96, wherein the additive is selected from plasticizers, detergents, and antifreeze.

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99. The process of claim 84, wherein the container is designed to allow a mixing of the concentrate in the first compartment and the polar solvent in the at least one second compartment inside the container.

101. A container for providing a fuel for use with a direct liquid fuel cell, the fuel comprising at least one metal hydride compound and a polar solvent and having a hydroxide ion concentration of not higher than about 7 moles per liter, wherein the container comprises a first compartment and at least one second compartment, the first compartment containing a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration which is higher than the hydroxide ion concentration of the fuel, and the at least one second compartment containing a solvent, and wherein combining the solvent in the at least one second compartment and the concentrate in the first compartment affords the fuel.

102. The container of claim 101, wherein the container is sealed and allows a mixing of the concentrate and the solvent in the at least one second compartment before discharging same from the container.

103. The container of claim 101, wherein the container is associated with instructions to allow the concentrate and the solvent in the at least one second compartment to mix before discharging same from the container.

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104. The container of claim 101, wherein the first compartment and the at least one second compartment do not surround each other.

105. The container of claim 101, wherein the first compartment is at least partially surrounded by the at least one second compartment.

106. The container of claim 101, wherein the at least one second compartment is at least partially surrounded by the first compartment.

107. The container of claim 101, wherein the concentrate contains the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

108. The container of claim 101, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , $\text{Be}(\text{BH}_4)_2$, $\text{Ca}(\text{BH}_4)_2$, $\text{Mg}(\text{BH}_4)_2$, NaCNBH_3 , LiH , NaH , KH , CaH_2 , BeH_2 , MgH_2 , NaAlH_4 , LiAlH_4 , and KAlH_4 , and the concentrate further comprises at least one of LiOH , NaOH , KOH , RbOH , CsOH , $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$, and NH_4OH .

109. The container of claim 108, wherein the polar solvent comprises at least one of water, methanol, ethanol, ethylene glycol, diethylene glycol, glycerol, acetone, methyl ethyl ketone, diethyl ketone, methyl acetate, ethyl acetate, dioxan, tetrahydrofuran, diglyme and triglyme.

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110. The container of claim 101, wherein the concentrate comprises water, at least one of NaBH_4 and KBH_4 , and at least one of NaOH and KOH .

111. The container of claim 110, wherein combining the concentrate with the solvent in the at least one second compartment affords a fuel having a concentration of the at least one metal hydride compound of at least about 2 moles per liter.

112. The container of claim 101, wherein combining the concentrate with the solvent in the at least one second compartment affords a fuel having a concentration of the at least one metal hydride compound of at least about 3 moles per liter.

113. The container of claim 111, wherein the concentrate is substantially free of any additives which adversely affect the stability of the at least one metal hydride compound.

114. The container of claim 101, wherein the concentrate is substantially free of any stabilizer for the at least one metal hydride compound which is different from a hydroxide ion providing compound.

115. The container of claim 113, wherein the solvent in the at least one second compartment comprises at least one additive for the metal hydride containing liquid.

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116. The container of claim 115, wherein the additive is selected from plasticizers, detergents, and antifreeze.

119. A packaged combination for providing a fuel for use with a direct liquid fuel cell, wherein the combination comprises a first container and at least one second container, the first container containing a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration which is higher than a hydroxide ion concentration of the fuel, and the at least one second container containing a solvent in an amount sufficient to result in the fuel if the solvent in the at least one second container and the concentrate in the first container are combined.

120. The packaged combination of claim 119, wherein the combination is associated with instructions to combine the concentrate in the first container with at least a part of the solvent in the second container.

121. The packaged combination of claim 119, wherein the concentrate contains the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

122. The packaged combination of claim 121, wherein after storing the concentrate for 4 weeks at about 25°C not more than about 2 % of the at least one metal hydride compound has decomposed.

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123. The packaged combination of claim 119, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , $\text{Be}(\text{BH}_4)_2$, $\text{Ca}(\text{BH}_4)_2$, $\text{Mg}(\text{BH}_4)_2$, NaCNBH_3 , LiH , NaH , KH , CaH_2 , BeH_2 , MgH_2 , NaAlH_4 , LiAlH_4 , and KAlH_4 , and the concentrate further comprises at least one of LiOH , NaOH , KOH , RbOH , CsOH , $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$, and NH_4OH .

124. The packaged combination of claim 121, wherein the concentrate comprises water, at least one of NaBH_4 and KBH_4 , and at least one of NaOH and KOH .

125. The packaged combination of claim 121, wherein combining the concentrate with the solvent in the at least one second container affords a fuel having a concentration of the at least one metal hydride compound of at least about 2 moles per liter.

126. The packaged combination of claim 119, wherein combining the concentrate with the solvent in the at least one second container affords a fuel having a concentration of the at least one metal hydride compound of at least about 3 moles per liter.

127. The packaged combination of claim 119, wherein the concentrate is substantially free of any additives which adversely affect the stability of the at least one metal hydride compound.

128. The packaged combination of claim 119, wherein the concentrate is substantially free of plasticizers, detergents and antifreeze.

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129. The packaged combination of claim 128, wherein the concentrate is substantially free of any stabilizer for the at least one metal hydride compound which is different from a hydroxide ion providing compound.

130. The packaged combination of claim 119, wherein the solvent in the at least one second container comprises at least one additive selected from plasticizers, detergents, and antifreeze.

132. A method of reducing the decomposition of a fuel for a direct liquid fuel cell during storage of the fuel, wherein the method comprises storing the fuel as a concentrate and diluting the concentrate to prepare the fuel only before using the fuel in the fuel cell, the concentrate comprising at least one metal hydride compound, a polar solvent, and at least one hydroxide ion providing compound, wherein after storing the concentrate for 4 weeks at about 25°C not more than about 2 % of the at least one metal hydride compound has decomposed.

133. The method of claim 132, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , LiH , NaH , and KH .

134. The method of claim 133, wherein the concentrate comprises the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

135. A container for making a fuel for use with a direct liquid fuel cell, wherein the container comprises a first compartment and at least one second compartment, the first compartment

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containing a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration which is higher than a hydroxide ion concentration of the fuel, and the at least one second compartment containing a solvent in an amount which is sufficient to afford the fuel if the solvent in the at least one second compartment and the concentrate in the first compartment are combined, and wherein after storing the concentrate for 4 weeks at about 25°C not more than about 2 % of the at least one metal hydride compound has decomposed.

136. The container of claim 135, wherein the concentrate contains the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

137. The container of claim 135, wherein combining the concentrate with the solvent in the at least one second compartment affords a fuel having a concentration of the at least one metal hydride compound of at least about 3 moles per liter.

138. The container of claim 136, wherein combining the concentrate with the solvent in the at least one second compartment affords a fuel having a concentration of the at least one metal hydride compound of at least about 2 moles per liter.

139. A process for filling a liquid fuel cell, wherein the process comprises using the container of claim 101 as a filling device for the fuel cell.

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EVIDENCE APPENDIX

None.

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RELATED PROCEEDINGS APPENDIX

None.